5th Workshop Report

Shaping Low-Carbon Areas

Helsinki, 10-12 April 2018

Contents

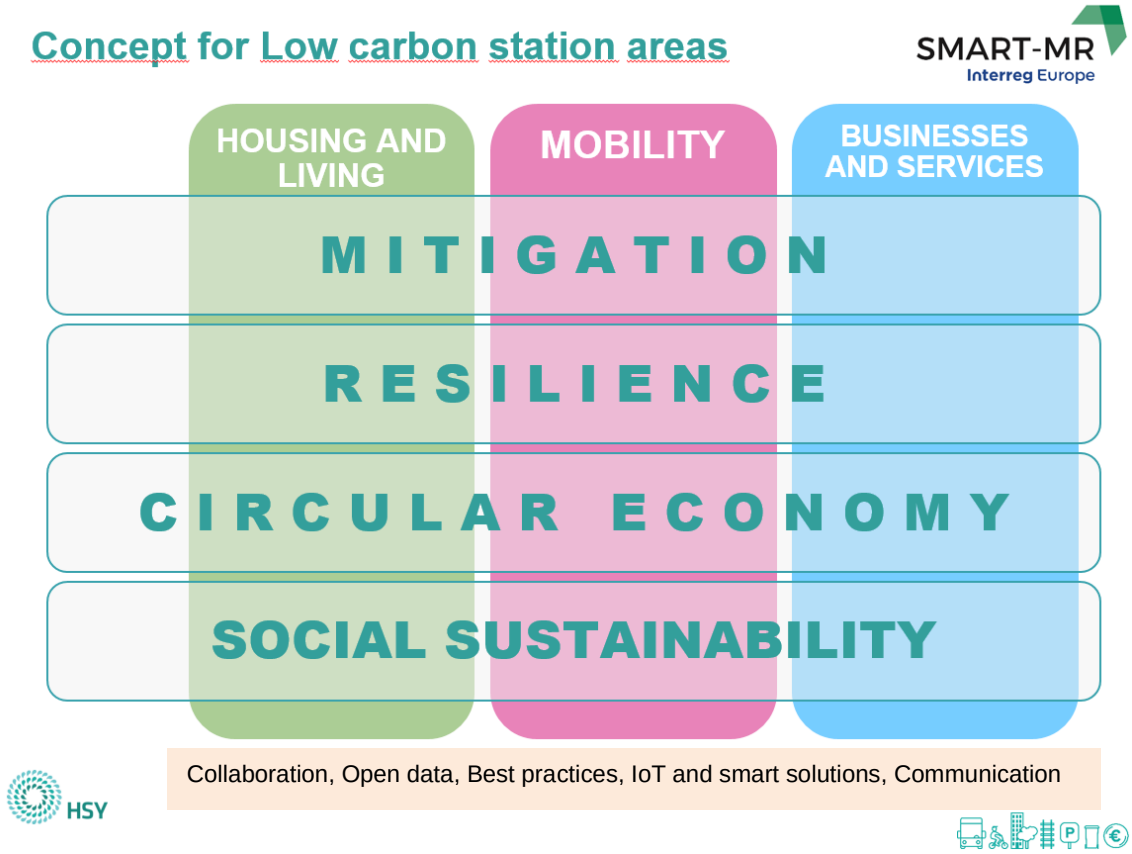
WORKSHOP INTRODUCTION

Station areas hold a key position as enablers for climate-smart everyday life. They are nodes for traffic and offer an excellent platform for low-carbon urban development. It is characteristic for low-carbon areas that they include energy-efficient buildings; they are designed in a way that it is easy to walk and ride a bike; the use of public transport is seamless and daily mobility does not require a passenger car. The low-carbon station areas provide a sufficient service palette for everyday needs. A vibrant station area enables a sharing economy.

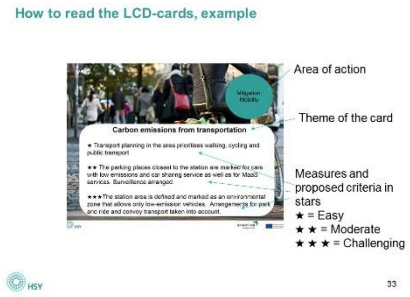
HSY has developed a *Low-Carbon District* concept as part of the SMART-MR project. The purpose of the concept is to recognise the key measures for promoting a low-carbon approach in developing station areas and to integrate them in the urban planning.

The concept will help cities to develop low-carbon areas both in existing urban structure as well as in the planning of new station communities. The concept will set targets for low-carbon station areas and compile measures which can be used for reaching the targets. It includes around 60 criteria which were analyzed in the 5th SMART-MR Workshop, Shaping Low-Carbon Areas.

In the Low-Carbon District concept, first there were three perspectives of low-carbon station areas: housing and living, mobility, and businesses and services, and four cross-cutting themes: climate change mitigation, resilience, circular economy and social sustainability. After discussions it was clear that there is a need for forth perspective: land use.



Low-Carbon District criteria cards were developed by land use and transport planners and circular economy specialists in Helsinki region as a basis for discussions. These cards included criteria from all themes and also measures and ideas for implementation. The measures were qualified into three different levels, easy, moderate and challenging.



Land use principles which guide land use efficiency and infilling of urban structure within station areas are derived from SMART-MR WS4 Transit oriented development. The principles were developed further to include low-carbon perspectives and goals.

Low-carbon housing requires zero energy building in new building stock, retrofitting in existing stock and renewables as an energy source. In transport planning, low-carbon planning principles consist of supporting walkability, bikeability and interchanges in trip chains, but also setting out constraints or strategic principles for parking and private car use.

A circular economy and resource efficiency will be vital parts of a carbon-neutral society and saving raw materials. Also, a livable community will make a sharing economy possible, with the assistance of digitalization. Developing a low-carbon community and social sustainability is an important part of the decarbonisation of society, while it still needs both raised awareness and assistance in behavioral changes.

An adequate service level in transportation nodes will serve both interchange passengers and local residents giving more attractiveness to rail transportation. Investment in low-carbon urban infrastructure is an important method facilitating the transition to a low-carbon society in every sector.

PRESENTATIONS

In the morning of the first workshop day, on behalf of the SMART-MR project, Project Manager, Dr Janez Nared, gave a welcome speech and SMART-MR video was presented to the audience. Mr. Olli Maijala, Ministerial Adviser at the Ministry of the Environment, opened the workshop by welcoming the participants to the workshop on the side of the National Government of Finland. In his speech he addressed the topic of shaping low-carbon station areas from three different approaches: 1) the integration of land use (housing, jobs and services) and transportation in metropolitan regions, 2) low-carbon goal, specially concerning transport sector and 3) sustainable urban development, including innovative cross sectoral smart city solutions.

As an inspiring starting point for the workshop Professor of Sustainable Architecture Steffen Lehmann gave a key note speech on the subject ‘Integrated Sustainable Neighbourhoods and Low-Carbon Cities'. Professor Lehmann leads the way in sustainable urban development and his experience in sustainable urban development and architecture spans over 30 years. First he presented The UN’s Sustainable Development Goals (SDGs) which form the basis for the ‘New Urban Agenda’, and specially the Goal number 11, which is the goal for Sustainable Cities. Transit corridors are vital for urban development. Within the Transit Oriented Development (TOD), the cities are able to develop more housing within walking distance of the railway stations and along the railway corridors, thus reducing car-dependency and CO_2 emissions. In this way, more people are linked to public transport. He highlighted that while the whole of the city should be transformed towards low-carbon, the station areas offer particularly good starting points for this transformation. Railway stations are a microcosm of the larger city

After Mr Lehmann´s key note, the metropolitan regions gave their presentations of good and bad practices of shaping low-carbon areas. Then Project Manager Pia Tynys from HSY introduced the concept of Low-Carbon District and the included criteria. The concept is focused on station areas.

At the beginning of the second day, two regional low-carbon area development projects were presented by the municipalities in the Helsinki region. Architect Sampo Sikiö from the City of Espoo presented the case Niittykumpu, area within new metro station in which Breeam Communities concept was used to implement sustainable elements in the planning process. Architect Anna-Riitta Kujala from the City of Vantaa presented the case Kivistö, where One Planet Living concept was introduced as a method to develop a detailed plan towards Low-carbon area.

In the third presentation Suvi Anttila, Senior Specialist at the Ministry of the Environment, presented the ’Smart Stations’ project in which stations were turned into marketplaces and test beds for companies and low-carbon solutions. In the pilot project the companies were provided a free-of-charge marketplace and test bed during a consumer event in the seven stations. In April 2018 implemented experiment was coordinated and financed by the large station area development network which includes key actors from public sector, ia. the Ministry of Environment, HSY, Finnish Transport Agency, Smart & Clean Foundation and The Finnish Innovation Fund Sitra.

WORKSHOP SESSION 1: SHAPING LOW CARBON AREAS – CLIMATE CHANGE MITIGATION AND ADAPTATION

In the workshop session 1 the main themes in the round table discussions focused on climate change mitigation and adaptation. The workshop participants were divided into six groups and the discussions concerned the topics: housing and living; mobility; businesses and services. These topics were discussed through the main themes. The low-carbon criteria cards were used as basis for the discussions. The perspective of housing and living included also the land use aspect.

Mitigation in Low Carbon Areas

Housing and living: it was discussed that there is still lack of fully developed regional calculation model for calculating all greenhouse gas emissions in the area. Calculation methods are available but further development is still needed. Station areas were considered to have a lower level of greenhouse gas emissions than other areas in the city. Generally, it was agreed that consumption-based greenhouse gas emissions should stay below 2 tons/inhabitant though every country set their own limit values.

Calculating and reporting the carbon footprint of building life cycles (including building materials, transport emissions, machinery emissions) was considered relevant for all areas and calculation and reporting on pilot buildings should be already in legislation in all the countries. Buildings energy efficiency leveling systems are generally in use, and technically calculations of carbon footprint of building life cycles can be done. What should be considered more, is the usage of local materials during construction. For reduction of water consumption in buildings several campaigns have been done in all the countries.

Concerning temperature control of buildings, it is relevant that protective building elements and vegetation are utilized without undermining solar potential. Also, it is relevant that reflective or light materials, surface materials and coloring are used. What was considered more challenging by the workshop participants is to consider and predict the microclimate (shading, city wind tunnels, the heat island phenomenon). The issue was especially a challenge in southern countries, as in Nordic countries exist less practices for e.g. air conditioning. Also control in old buildings and different isolation methods and materials pose some challenges.

On solar panels, the participants discussed what would be the wanted percentage of surface area for solar panels taken into use. In Barcelona regulation states generally 10 % but depending on the size and also the use of the building. The green roofs and solar panels are competing on the surface areas which makes the solar energy production more complex. In Italy also balconies were used to introduce solar panels. In Italy, Slovenia, Sweden and Portugal it is possible for individuals to sell the produced solar energy to the grid.

As already concluded in the 4th workshop in Gothenburg, the density of the area is a key element for low-carbon areas. Denser areas exist specially in station areas. To build more livable areas the land use should be mixed: housing, street level business and other facilities and services. According to

recommendations from the Gothenburg workshop 40-60% of the built floor area should be reserved for services and offices within 500 m radius of the station.

Mobility: To reduce the carbon emissions from transportation, it was agreed that the transport planning should prioritize walking, cycling and public transport, though it was also argued that first priority should be to reduce the need to travel by shaping mixed used and dense urban communities.

Parking in station areas was emphasized as a complex issue by the workshop participants, and it should be discussed depending on the specific station area, if cars are needed at all, or if the parking can be reserved for e-cars only. It was agreed that cars shouldn't be prioritized in station areas, and that specially in low density areas commuter parking should therefore be reduced. Land ownership and difference between existing and new areas are vital to recognize when planning low-carbon mobility in station areas.

It was agreed that the trip chain planning is needed to support the public transport: smart measures, real time information, accessibility to all, and reliability of the service. It creates more smooth and faster travelling, also in situation of changes in public transport arrangements. It enables a better connection between different means of transport, with crossing lines and to broaden the network. Also the mobility plans for persons and companies including car pooling and sharing, were considered as a valuable addition for a more flexible mobility, not just organized by the public sector.

Linked with the rail service and it's accessibility, the discussion focused on last mile solutions: taxis and busses as cheap last mile solutions; introduction of automatic vehicles and different forms of on-demand-services.

For promoting pleasant walking environment was emphasized; accessibility to stations and interesting environments to walk in. Underpasses and stairs on station areas were considered problematic.

Good bicycle path network includes not only well established and safe bicycle paths with an access to the stations but also other infrastructure for cycling: e.g. bike and ride solutions, safe bike stands, possibility to take the bike to public transport. City bike system was discussed as one key solution to promote cycling, and also different campaigns and facilities (showers, lockers) at work places. There are several on-going projects related to cycling, e.g. a winter bike project in Gothenburg, folding bikes in Barcelona.

Businesses and services: Mixed land use is a key to create dense and lively station areas but a change in attitudes is also needed for bringing more and a variety of businesses to station areas. Stations as nodes of transport have an un-identified business potential. There is a need for balancing with the expectations of the service providers and the customer needs. It was discussed that to reduce parking spaces might be considered to reduce attractiveness from companies' point of view. Therefore, more fact-based information is needed on customer flows at station areas. If the area is dense and lively there will be also more potential customers.

Furthermore, it was concluded that the variety of services including e.g. renting services and non-commercial services should be considered in the urban planning. For example, there is an on-going discussion in Oslo about placing swimming pools to transport nodes. Meeting rooms, office hotels,

internet cafés, online shop pick-up-points were mentioned as attractive services and relatively easy to establish.

It was discussed that coordination is needed when station areas are developed. There could be an 'umbrella actor' to plan and coordinate the station area development. Another vital point is that station areas should be developed in a way which considers the station area's unique identity, and not by developing all station areas with the same concept.

Energy efficiency counselling for companies is generally provided in all the countries, e.g. the Oslo Future Programme with 50 pilot projects where experts guide the constructors in energy efficiency during the construction. Guidance can also be implemented by setting criteria for service providers, like the City of Lappeenranta (Finland) which branded its station area by requiring the entering businesses to provide an idea for the reduction of greenhouse gas emissions.

Climate Change Adaptation in Low-Carbon Areas

Housing and living: The main criteria on climate change adaptation (resilience) deal with risk management planning in the area, like storm water and flood risk management. Another means is the reduction of heat island effect specially in dense urban structure, with temperature balance control of dwellings and cooling the city by adding green structure, like green walls and green roofs.

Some of the metropolitan areas recognized the problems with storm water and flood risks. Heavy rains are common for example in Barcelona and Budapest. Gothenburg has challenges with the river delta, which makes flooding more difficult in the sea shore. In Porto and Oslo the terrain profile impacts the runoff and flooding is not common. In the implementation of flood risk plans also tanks were considered a cheaper solution to prevent flooding specially in new buildings.

In temperature balance control of buildings, the orientation of buildings was considered relevant for all countries but challenging in already built urban structure. For example, in Barcelona there is a legislation for new buildings. In Nordic countries heating and cooling at the same time make the temperature balance control challenging. In Helsinki there is a new district cooling system and both district and building level solutions are discussed. More development is needed in this theme.

Mobility: The criteria for Safe and attractive streets and station areas steers that weather and climate impacts should be considered in the design and maintenance of streets, sidewalks and bicycle paths.

Businesses and services: In the discussions it was considered challenging to create new ideas of businesses and services in climate change adaptation. One example came from Lyon, where a climate friendly area is created by changing a wide street area into a more resilient zone: trees were added, rainwater systems were installed under the streets, new measuring for air quality and also warning signs were created. Streets were painted white for cooling.

WORKSHOP SESSION 2: SITE VISIT – SMART KALASATAMA

The workshop participants were guided through the Kalasatama area on a walking tour. Kalasatama, a brownfield district in Helsinki is a new neighbourhood that also works as an innovation platform. The area is a model for Helsinki's smart city development 'Smart Kalasatama'. The area is developed flexibly and through piloting, in close co-operation with companies, residents, city officials and researchers. The aim is to co-create smart and clean urban infrastructure and services. Different aspect of smart and sustainable solutions were introduced during the walk on five stopping points:

1. Introduction of the project 'Smart Kalasatama'

Kalasatama district is one of the fastest growing areas in Helsinki in the coming years (25,000 residents and jobs for 10,000 people by 2035). The vision of Kalasatama is that smart services save one hour of citizen's time every day. The district combines public services such as health and wellbeing centre, school and university of applied sciences, office buildings and business premises. Culture center Suvilahti and Teurastamo, focusing on food culture, host wide variety of events. The combination of versatile activities and efficient land use aims at an active and vibrant area from morning till evening.

2. Smart Energy Solutions

Helen, ABB and Fingrid built the smart grid in which the user of electricity can also be its producer. First estates are already connected to smart grid, and all the rest to be built will benefit of the grid enabling real time smart metering, electric vehicles network and new storage solutions for electricity. Several solar power plants already exist in the area and the whole district is connected to the district heating and cooling grid. The first two-way charging point in Finland is installed in Suvilahti as part of the EU funded mySMARTLife project in connection with Helen's solar power plant and electricity storage facility. The V2G (vehicle-to-grid) charging point enables not only charging of an electric vehicle, but also using it as an electricity storage unit and utilizing it in the balancing of the electricity system.

3. Public transport

Effective public transport is a key low-carbon solution, and one of the greatest benefits of the district. After opening in 2007, a metro station serves the Kalasatama area. In the 2030s, after construction is completed, some 23,000 passengers daily are estimated to pass through Kalasatama station. Länsimetro, connecting Kalasatama to Helsinki's neighbour city Espoo, was opened on the 18th of November, 2017 providing a metro service to Helsinki city centre every 2.5 minutes in peak hours. With new tramlines and bus routes, Kalasatama will serve as a highly used intersection of public transport in the future.

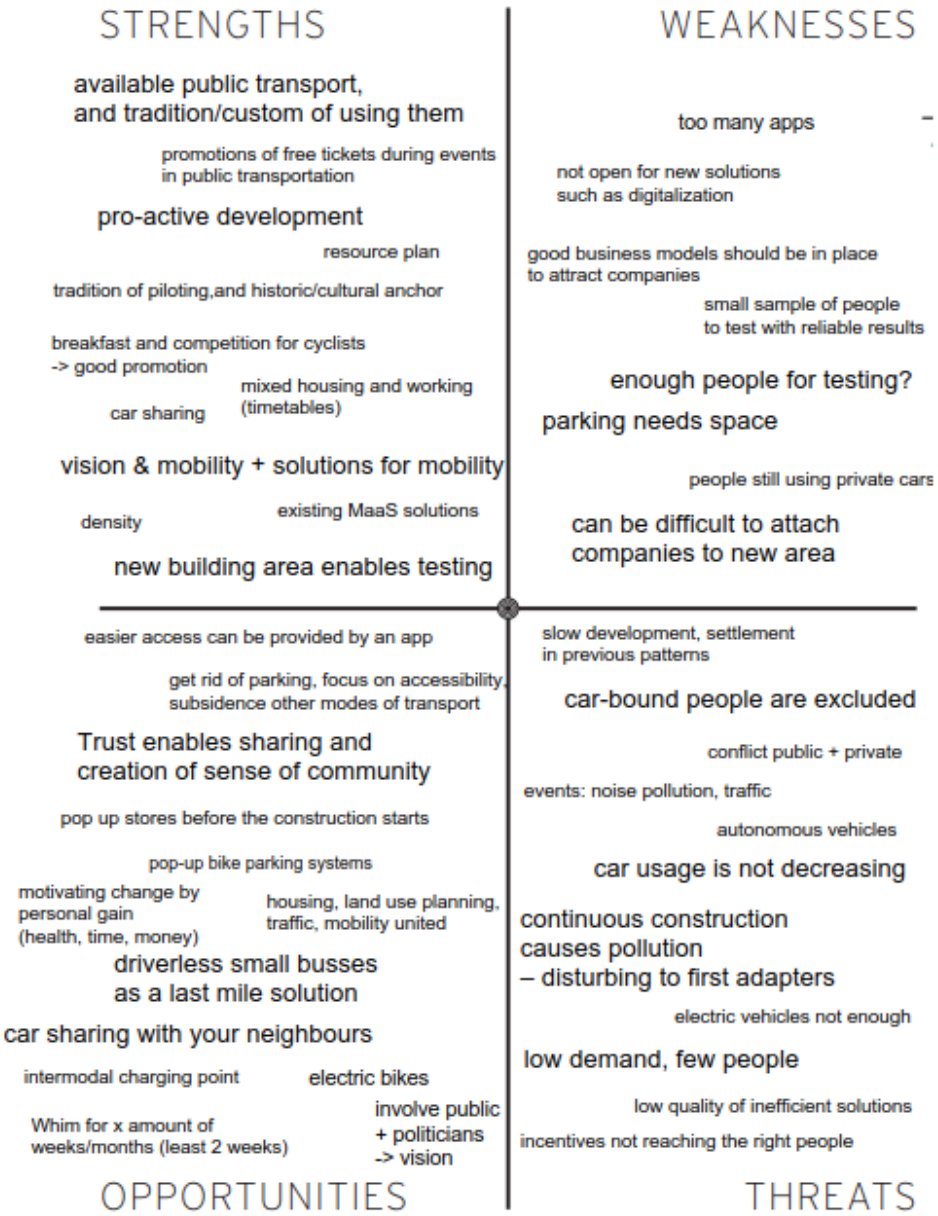
4. New construction and parking solutions

The city of Helsinki has started to build new premises in Kalasatama to combine it's all urban planning and development offices scattered around the city to one location. There are seven floors and one underground floor with 75 parking places and 500 bicycle places in the new building. With the growing flexibility on work conditions – increase of multipurpose facilities and flexible work schedules – the personnel are encouraged to use of shared cars, public transport and cycling. Combining different ways of transport requires flexible parking solutions and Mobility as a Service kind of thinking and practical solutions.

5. Sharing economy test bed

Several sharing economy services have been piloted in Kalasatama, e.g. Rent-a-park service and Flexi Spaces for sharing underused spaces. One can rent tools and home appliances from Liiteri, a smart container. An old abattoir from the 1930s was re-opened as Teurastamo (eng. abattoir) to residents, tourists and businesses in September, 2012. Currently there are a dozen active businesses operating in the Teurastamo area, ranging from restaurants to urban events, from a business college to a coffee roastery and from a distillery to a pasta factory.

At the end of the walking tour, the workshop participants gathered at Teurastamo to discuss and conclude what they had seen during the tour. Discussions were held in the working groups dealing with urban planning practices, parking, MaaS solutions, sharing transport services, changes in attitudes and test block experiments. The discussions are concluded in the form of a SWOT analysis (see picture).



WORKSHOP SESSION 3: SHAPING LOW-CARBON AREAS – CIRCULAR ECONOMY AND SOCIAL SUSTAINABILITY

Circular Economy in Low-Carbon Areas

Housing and living: The participants of the workshop discussed the significance of communal spaces as an important theme for development. It improves the utilization rate of buildings and creates social sustainability. In Kalasatama site visit participants were introduced the ideas of common spaces in buildings, both indoor, outdoor and parking spaces, utilizing smart locking systems. In Helsinki there are many new shared offices and web based system to rent spaces is in use.

In the discussion on the optimization of building utilization it was considered important to create mixed spaces for different kind of use. Renting spaces were considered as one option for increasing utilization (apartments for daytime offices). It also decreases the need to travel. The adaptability of buildings was also considered important, and a potential for different kind of open hub solutions was recognized, but good planning and vision are needed. The adaptability is easier to implement in new buildings than to transform existing building stock. In Barcelona there is an example of adaptable apartment building (WALDEN 7), which is built out of blocks and individuals can buy or rent the amount for their needs (1, 2 or 3 blocks).

Sorting possibilities of waste were not considered to have a specific role in station areas, but as a place for communication campaigns the stations are visible and effective. Reducing waste should be considered in the development of Low-Carbon District criteria, and recycled materials were seen important in procurement processes.

The idea of green structure as a public fruit garden was established in Ljubljana. Also, local community gardens and urban gardening was common in many cities, like in Budapest. In Gothenburg there is a pilot of farming the language – building a community with immigrants and schools to farm together.

Promoting circular economy to the residents was also common in many cities. In Ljubljana there is the Library of Things, where individuals can bring and lend consumer goods instead of buying. Different kind of web based second hand shops are common in Finland, and also waste food restaurant pilots are starting. This kind of development should be supported by circular economy advisory services. As a starting point for this it was suggested to follow the idea of 5 R's: refuse, reduce, reuse, repurpose and recycle, an idea added to the waste hierarchy.

Mobility: Bike sharing was introduced as an important method to increase circular economy in mobility. Bikesharing system should be easily accessible and easier to use if the system is similar across Europe. The system should be part of public transport planning. The peak hours were considered problematic as the need for mobility is the highest at the morning and after work. Also, logistics is a challenge, which can be dealt with mixed land use planning. Some sort of bonus system (free ride minutes) was introduced in order to help the returning of bikes to certain stations. In many cities tourists increase the demand which can be challenging for the planning. In the discussions the need for e-bikes in bike sharing was recognized and also the need for locks for city bikes.

Promoting the use of car-sharing cars attracted controversial views. First, the need to remove cars away from Low-carbon areas was seen important but, secondly, also to reduce amount of cars by sharing them was important. Car sharing parking solutions should follow the principles developed in Gothenburg: cars should not be situated in stations. Car sharing cars could have some incentives, like free parking places. But it needs to be remembered that car sharing does not reduce the number of cars in a big scale. In Oslo there is an application 'your neighbours car' which works as a car sharing instrument and also supports sharing economy and effective use of vehicles. The amount of car sharing cars was also discussed but no recommendations were formulated.

Business and services: There was a long discussion during the workshop on how to support business activities of circular and sharing economy. Stations were considered a good place for the purpose, the public space and the infrastructure, good opportunities to drive it forward by the public sector with regulations. Stations can play in the role of a service center which reduces the need of mobility and extra trips. It also improves safety in stations. Municipal services could be centralized to stations or near them. In Russia the stations are places for small markets, and this kind of development could be supported by public sector. The grass root level was considered important in circular economy, the neighborhoods need to be included in the development process, and the public sector could take the role of a facilitator. Activation of companies towards circular economy is another measure which the public sector can take forward. A circular economy should be promoted by law, tax reductions and companies should be rewarded for efficient measures. Specially, the mobile services would fit well into station areas, as they are suitable for seasonal services. It should be noticed that different regulations exist, as in some cities it is for example not allowed to eat or drink in stations.

A new idea was introduced during the workshop discussions, there would be a need for an application to provide comprehensive, fact based and comparable information to guide individuals toward sustainable life choices. For example, the application could show the carbon emissions produced during a hotel visit compared with carbon emissions that would be produced by staying at home.

The need for change in behavior was emphasized in the discussions. It was seen possible, with mentioning the example of reducing plastic bags.

Social Sustainability in Low-Carbon Areas

Housing and Living: Social sustainability is very important in urban planning, and the key for creating socially sustainable low-carbon communities. Life cycle housing was discussed as a way to create a strong sense of community. The need to control the housing prices was recognized as it should be affordable. Also, social innovations in housing could create and offer new kinds of social services. Strengthening the participation already starting from the planning phase is important and to show the participants that they benefit from it.

Safety aspects are emphasized at stations which are important meeting points and could potentially offer cozy places for people to sit down and talk. Services can support safety aspects by creating activities to station areas. Even a small kiosk increases the feeling of safety. Cameras were not seen as a solution to increase feelings of safety, but lighting was seen very important. Different kind of stations need different kind of solutions in improving safety – in main stations it is not considered a problem in

the same way because of social control. Also, female safety perspective was brought to conversation, also young people can be more afraid.

To increase the microclimate in stations or train stops it is important to have shelter from sun, rain and wind. Heat in south and coldness in north are also problems to be solved. If waiting and changing times are long, there is a need for a more quality and services in station buildings.

Mobility: There was a large conversation about walkable city -idea. It was seen hard to combine high density on station area and human scale. This needs to be developed further in detail planning.

In terms of **business and services**, it was seen important to have services on station, which creates lively neighbourhoods. Sharing economy was seen to create community.

WORKSHOP SESSION 4: POLICY RECOMMENDATIONS

The focal observation of the workshop discussions was that it is vital to support the change in people's behaviour towards driving cars and travelling by train. Moreover, the reduction of the necessity to move about should be striven for. The station area provides a possibility for this by centralising housing, services and the opportunity for low-carbon mobility. It calls for a comprehensive rail network and efficient feeder traffic.

The LOAD concept (Liveability Oriented Area Development), which was developed in the 4th SMART-MR Workshop in Gothenburg from the perspective of efficient land use and land use mix in station areas, was recommended to be applied both for pre-existing station areas when complementing the urban structures and for new station areas when planning land use. According to this concept, within a 500-metre radius from the station, land use should be efficient, especially in larger urban areas > 1.0 area floor space index in larger urban areas, > 0.5 area floor space index in small urban areas. The dispersion development, which is typical for urban areas, can be prevented by locating new constructions near the rail traffic corridors.

Housing should also be mixed; i.e. the station areas should provide different types of housing supply for different needs. It is also important to increase affordable housing near the stations.

Discussions on topics which concentrated on mobility, the focus was set on the promotion of walking and cycling, on trip chains and car parking. Direct, unobstructed and barrier free connections to the station areas were considered focal from the point of view of walking and cycling. In addition to these, the cities should invest in safe bicycle parking solutions closest to the stations so that people can easily use bicycles instead of cars in feeder traffic. The winter season in Northern Europe was identified as one challenge for cycling and the heat during the summer months in Southern Europe. To locate the city bikes at the stations could offer an option for the use of one's own bicycle and this concept could also be carried out using electric bicycles.

Main Policy recommendations in shaping low-carbon areas:

- supporting the change of behaviour,

- support reducing the need for travelling,
- creating a holistic mobility strategy,
- supporting Transit oriented development (TOD),
- developing land use according to LOAD (Liveability Oriented Area Development) principles (500 m, 1000 m from station),
- developing mixed land use,
- creating multifunctional buildings and integrating business with housing,
- supporting walking and cycling with direct accesses towards a station,
- offering safe and adequate bike and ride services closest to a station,
- smoothing trip chains in public transport with good planning and providing apps for last mile services and MaaS services,
- reducing car parking possibilities near a station,
- supporting businesses and services within stations, with incentives from the municipality,
- creating circular economy business and services,
- offering low-carbon city logistics services within a station,
- offering last mile transport services within a station,
- improving safety aspects on stations, specially safety of women and young people.

COMMENTARY

The aim of the workshop was to share experiences and good practices, and to exchange knowledge among SMART-MR metropolitan regions on how to develop Low-Carbon Areas. The theme was familiar to most of the cities and the climate goals and challenges are common, so it gave a good basis for discussions while the measures were not widely identified.

The station areas were recognized as potential starting points for low-carbon society as there are possibilities for low-carbon modes of transportation and for centralization of housing and services to reduce the need for travelling. The holistic regional plan combines land use, housing and transportation and can promote the transit oriented development in metropolitan regions.

As climate change mitigation in transport sector is widely recognized as an urgent action, the focus in low-carbon stations is to develop walking and cycling possibilities, public transport and smooth trip chains. In station areas cars are not considered necessary and the brave proposal in the workshop was to move the Park and Ride areas further away from the station and replace them with safe and weatherproof Bike and Ride areas.

Main hinders to use the stations should be analyzed. The feeling of safety can be improved in many ways with lighting and increasing population and users in the area. Increasing housing and inhabitants improve the ability of services to enter the region and to increase their profitability. Circular economy was considered a potential way to develop businesses and services in these transport nodes. The role of public sector was seen in encouraging and facilitating businesses, also private sector and citizens' initiatives. Social sustainability is an important theme in developing future cities and in livable oriented station community it can be improved, also with effort of public actors.

The extensive criteria, which have been worked on beforehand, was appropriate as the basis for the discussions. The participants criticized to some extent that the criteria were steering the discussion towards a certain direction and that a part of the criteria was not suited for implementation in the public sector. On the other hand, they were commended for their comprehensiveness and for including circular economy. The LCD criteria cards were seen as a possible interactive tool in the planning phase.

The results gained from the workshop will be taken into consideration in the further development of the criteria for Low-Carbon District. The set of criteria will be completed by the end of 2018 with assistance of Dr Steffen Lehmann.